



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## No. II.

DIMINUTION OF LABOUR ON SUGAR  
PLANTATIONS.

*The Thanks of the Society were voted to Mr. W. A. CLEMENTS, Annotto Bay, St. George's, Jamaica, for the following paper on the Diminution of Human Labour on Sugar Plantations by the Introduction of Machinery.*

*Donnington Castle, St. Mary's, Jamaica,*

SIR,

*29th December, 1840.*

FROM a public notice given in the papers of this island lately, I am induced to forward for perusal at the first meeting of your Society the enclosed "Account of the most advantageous mode of Diminishing Labour on Sugar Plantations by the Introduction of Machinery," founded on experience, and also to offer myself as a candidate for admission as a member. I shall be obliged by your forwarding me a copy of your rules, and for any other information you can give to enable me to be a useful one.

I am at present the overseer, or resident-manager of this establishment, the property of Sir W. W. Dalling, Bart., but my address is Annotto Bay, St. George's, Jamaica.

I am, Sir, &c. &c.

W. A. GRAHAM, Esq.

WM. A. CLEMENTS.

*Secretary, &c. &c.*

---

The following paper on the abridgement of human labour in the cultivation and manufacture of sugar in the

West Indies, was written by Mr. Clements, a planter in the parish of St. Mary's, Jamaica, and contains many useful hints on the subject. But that district of the island which comprises the parishes of Portland, St. George's, and St. Mary's, being peculiarly subject to wet weather, many of his observations are, by that circumstance, limited in their application to his own locality, where there are few days without a shower. The canes are, therefore, of rapid and luxuriant growth, and the juice weak and watery, two and three gallons of it often being required to produce a pound of sugar, whilst in the parish of Vere, and some others in the island, one gallon will yield the same quantity; consequently, less labour is required in all the operations connected with the manufacture of the sugar. In many of the other districts of Jamaica the trash is dried before being housed, so that the elevator which Mr. Clements proposes, to convey it from the mill to the trash-house, could only be used to take it from the yard, after being dried in the sun, though on some estates it is already in use upon his principle. Again, on many estates the land is too hilly to admit either of the plough or railways, though shoots are constructed on some to send the canes from the top to the bottom of the hills, where the carts receive them; on other estates some of the plans described are in operation already. It is hoped that these few remarks, and some short notes added to the paper, will serve to elucidate the views of Mr. Clements, and aid the reader in his perusal of it, without detracting from the merits of the original communication, and that he will excuse the liberty thus taken with his paper. It may be added, that the nature and character of the labouring population, and their attachment to old habits, form a serious difficulty in the way of improvements that time and great perseverance only will remove.

AN ACCOUNT  
OF THE  
MOST ADVANTAGEOUS MODE OF DIMINISHING  
LABOUR ON SUGAR PLANTATIONS,  
BY THE  
SUBSTITUTION OF MACHINERY.  
FOUNDED ON EXPERIENCE.

GENTLEMEN,

*Jamaica, 29th Dec. 1840.*

THAT life is precarious, particularly the lives of Europeans, in tropical climates, and is especially so considered in [some districts of] Jamaica, will not be disputed; but this dispensation of Providence does not militate against the general improvement of the country so much as the far greater precariousness in every grade of a planter's life. Of a studious, domesticated turn of mind, I have, from my arrival, most seriously reflected, and twenty years' experience has convinced me, that a reasonable lifetime is usually [?] thrown away by most persons coming to this island before the smallest chance is afforded them of settling in life. Twenty years' residence, supported by constant industry, dependent entirely on my character, and never yet being discharged, are the qualifications entitling me to make these reflections, which seem necessary to account for the apparent total want or neglect of improvement, and the tardiness evinced in adapting the contrivances of art to the abridgement of human labour, which must strike the most transient observer.

I can scarcely hope to gain the reward offered by your honourable Society; but if I induce one Jamaica proprietor to turn his attention to the subject by the suggestions I make, I shall be satisfied that my time is not thrown away.

As to the abridgement of manual labour in the cultivation of the sugar-cane, I conceive the application of ploughs, where the nature of the soil will admit, is sufficiently understood, and so strikingly advantageous as not to require observation, and the various weeding, mouldings, and cleanings of canes while young, may also, under the same restrictions, be performed by the cultivator regulated for the purpose. But in many situations these machines cannot be used; and as yet there is no means that I am aware of by which manual labour can be superseded in these operations; nor can I conceive how the universal operation of trashing canes (that is, taking off the useless leaves to allow the cane and its juices to ripen by admitting the sun and air) can be performed but by hand; and this cannot be dispensed with where the quality of the sugar is an object. Cutting the ripe canes, I conceive, might be accomplished by a machine; but every cane being of an unequal length, and a certain portion of the top being unfit for making sugar, in fact, very prejudicial to its manufacture if admitted through the mill, the imperative necessity of judiciously separating the unripe from the ripe part, requiring the simultaneous application of the eye and hand, interposes a serious difficulty, and, I fear, an insurmountable obstacle, to the application of a cane-cutting machine.

The canes once cut and tied, I consider the application of railways, or elevators, for their conveyance to the yard and into the mill, the trash or megas into the drying

houses, and out of them to the fireplace, presents the greatest opening for the abridgement of human labour; all these operations, incessant while the mill is at work, being at present accomplished, almost universally, by manual labour alone (if we except the carriage by horned stock or mules from the place where the cane grows to the mill); but generally the cane passes through people's hands in loading and unloading, at least once, and in some cases and situations, several times. It is scarcely credible, that during my residence in Jamaica, I have seen but very few properties where the construction of a single mile of railroad would not in a few crops save its costs in wages alone, exclusive of stock and loss of time by delay of loading, upsetting, &c. And on no one estate have I observed the smallest obstacle against the erection of round-robins,\* or elevators, for the purpose of carrying the green and dry trash; yet on one property only, Gibraltar Estate, St. George's,† in the hands of Messrs. Stewart and Westmorland,‡ has any thing like an attempt

\* Endless bands of canvas.

† "The contrivances and improvements contemplated on this fine estate, it is expected will effect a saving of much labour, to the extent of eighteen people each day the mill is at work, and the expense will not exceed 1400*l.* or 1500*l.*, including a heavy job of mason and millwright work, entirely distinct from the contemplated improvements. I would also observe in this place the very liberal and enlightened plan pursued by these gentlemen in sending a useful collection of books for the manager of the estate, well bound, and conspicuously marked with the estate's name, and a notice that they are not to be lent off the property. The works consist of the *Mechanic's Magazine*, Cobbett's useful works, *Davy's Agricultural Chemistry*, &c. &c.; such are of inestimable value to planters, as their monotonous and retired lives give them opportunity to improve their minds if the means are at hand.

‡ Also on the Bog Estate, in Vere and Chester Castle, in Hanover, where there are steam-engines with conveyor, &c. &c.

been made to adopt these self-evident means of abridging human labour in the manufacture of the staple productions of the island. The subordinate situation of overseer, or manager, in Jamaica, allows no scope for such practical improvement; but the peasantry, obstinately opposed to many of the ordinary occupations they used to perform in slavery, will compel the substitution of contrivances. The most remarkable of these dislikings, that I have observed, is carrying burdens on their heads. Thus canes, cane-tops, and manure, which formerly they used to carry cheerfully when required, is now almost universally refused, and the sooner some other means are adopted for the carriage of canes to the mill, and trash to and from the trash or drying houses, the more certainty will be afforded of making produce good and in regular quantities.

From these general remarks, it would be easily understood that I would at once adopt a system of railroad carriage on the estate. This, in many parts, could be accomplished with the fine hard woods of the country at a very trifling expense. What is termed a single rail, with carriages six feet by five feet with light framed sides four feet or five feet high, would be sufficient,—the weight of such a carriage loaded with plant-canes would be about ten or fifteen hundred weight (with ratoons\* it would be much less); the rails composed of the woods I have alluded to laid six inches by four inches, and let into the heads of posts two or three feet long, of the same dimensions, set in the ground four feet apart.† Such a rail,

\* The second year's growth from the same root, less juicy and heavy than the plant-canes.

† In the construction of the railroad, I have adhered to the simplest, such as can be easily accomplished by any country carpenters, considering time the great object of all our saving. The posts, being charred to the depth

with three or four such carriages working along the principal or main interval of an estate, communicating with each cane-piece, and direct to the mill, would facilitate the working in many ways; the canes would be brought by two or four cattle, according to the acclivity, with ease and certainty; the refuse of the mill-yard would be carried to the cane-pieces for manure, keeping every thing sweet and clean about the works. Such a railroad could, I am convinced, be put into operation for from 100*l.* to 300*l.* per mill, according to circumstances; and on some sea-side estates, perhaps, to import it would be cheaper, as the very slightest would be sufficient; the weight to be carried never could exceed in any instance (from the nature of things) what I have stated. The carriages made of stout framework boarded, with one side to open from the middle to each end, the more readily to discharge the load, with iron wheels and axles, might, I think, be furnished at an average for 10*l.* each, as they would, in all probability, last for years. If proprietors will only refer to the wages paid to carpenters for making and repairing the carriages at present in use, they will see a clear saving of a good income in this item

they are let into the ground, would last an immense length of time, and may hereafter answer for supporting the beds of an iron rail, when the improvement of times would sanction such an outlay. It is very striking how universally railroads are established where the proprietors or parties *directly interested* in procuring cheap labour are on the spot, instance the Wharves and establishments of that nature in Kingston, and on several sugar properties in Louisiana. In the latter case, locomotives and all the latest improvements in the steam engine, and mechanics generally, are eagerly sought after and adopted; and when abolition has accomplished its work in the southern states of America, I believe the want of labour will not entail the ruinous losses it has done in the British sugar colonies, owing to the attention that has always been paid by that "enlightened nation" to contrivances for the abridgement of human labour.



alone. Three such carriages may be drawn by four cattle, attended by one man, and will carry more canes to the mill in one hour than the same carriages moving on our ordinary roads (with eight cattle and two people each) will do in one day; thus leaving all other advantages out of the question, instead of six the planter has only to look for one steady labourer, to ensure his day's work, besides saving 7s. 6d. per day, or 136*l.* 17s. 6d. per annum, which will be, even if considered separately, as handsome a return as the same amount of capital invested in any railroad in Great Britain would produce.

The canes arrived at the mill, I will now proceed to consider its construction, and at once assert, without fear of contradiction, that whatever the moving power may be, a sugar-mill should be horizontal;\* and for this single reason, to abridge human labour. It cannot be supposed that people will hold canes evenly spread from the top to the bottom of a vertical roller four feet high, and every deviation from that is prejudicial to the well-working of the mill, and endangers the breaking of the very expensive wrought-iron gudgeons. Into a horizontal mill an elevator, or round-robin, will, with the greatest facility, take the canes constantly and evenly;† and, if

\* The horizontal rollers are undoubtedly the best; but by this plan in a cattle-mill the labour and friction are considerably increased. With steam engines the mills are almost always horizontal.

† Nothing gives to these contrivances so great a superiority over manual labour as their uninterrupted constancy. Our peasantry cannot be kept silent while at work; and, as they have yet to learn the inestimable value of time, a slight alteration or disagreement is sufficient to interrupt their occupation for hours, as all employed become engaged in the controversy to the total neglect of the work in hand, no matter how urgent or particular; and each department so hinges on the rest, that the least interruption of one retards the progress of the whole.

well constructed, can be worked by two oxen, should it be inconvenient or not desirable to abstract so much of the moving power from the mill, which I consider should at all times be fully adequate to at least a quarter more work in a given time than is usually required. Thus, if with reasonable attention, the crop can be accomplished at the rate of ten, fifteen, or twenty hogsheads per week, then the machinery should be fully adequate to thirteen, twenty, or twenty-five hogsheads respectively. My reasons for this arrangement are, that there is no certainty in the yielding of canes of different kinds and qualities and of different soils; and, as the best scale for the adjustment of wages is the quantity of produce made, it will be far more satisfactory to leave room for the labourers' exertions to increase it, than to cripple them by inadequate machinery; besides, it is so far a security against the precariousness of the weather. The application of contrivances to return the trash, or ground-cane, so as to extract all the juice is universally understood, and enables us to give it any direction we choose on its coming out of the mill. It is generally taken by a person (called a trash-turner) and put into baskets, which are taken away by others (trash-carriers) as fast as they are filled; and in every instance carried a distance, and deposited to dry in large buildings\* erected for the purpose. This is by far the most laborious work on a sugar estate, invariably performed by the very ablest females; and as it must (to economise the space) be closely packed up, it is constant severe labour from the moment the mill moves until it stops. To obviate this, in every point of view, very objectionable application of human labour, an

\* In many districts the trash is dried before housing. It is too wet for this in St. Mary's.

elevator made of stout canvas, or other cheap materials, should be attached to every mill so constructed, as to take the trash the moment it is freed from the mill, and convey it nearly to the roof, and along the whole length of the trash (or drying) house. It should be so contrived as to admit of being shortened or terminated at the end of every ten feet, so that as the house filled up it might not be impeded in its motion. This, I conceive, might be accomplished, either by straps and buckles or lacings at these intervals, which being added or taken off at rollers placed at these distances along the beams of the house, the elevator would be perfect, let it be delivering trash at any particular part between its least and greatest length.

I will now follow the cane liquor along the leaden guttering into the boiling house; and certainly the nearer the mill is to this house the better, or, in other words, the shorter the distance the liquor runs previous to coming in contact with the fire the better, as it is so very easily tainted or soured; and a great difficulty exists in keeping a large extent of surface perfectly [clean and] free from acidity. I must confess that all my experience and attention has suggested but very trifling improvements in the management of the liquor in the boiling house so as to abridge the human labour expended therein; and the only consolation is, that, though constant, the labour is of the lightest kind, and being performed under cover, generally in a light airy building, not by any means prejudicial to health, and consistent with perfect cleanliness, it is altogether, perhaps, the least objectionable part of the manual labour required on a sugar estate.

On a large estate with a windmill (the most precarious of all powers applied to the manufacture of sugar),

I have had receivers made of plank, leaded, containing 400 gallons each, in which I applied the temper lime to the cane-juice quite cold,\* and, when perfectly settled, drew it into syphons or pans so adapted that heat could be immediately applied by this process; a very great quantity of the impurities was extracted, rising to the top and being taken off by skimming or settling at the bottom of the syphons, the cane liquor draining off perfectly clear and fine, like good Madeira wine, but rather paler. In this state the labour at the copper or boiler was very trifling, except transferring the liquor from copper to copper, which is done by ladles. I have given this part of the process much consideration, but nothing seems to me to promise our great object of abridging human labour without suggesting to my mind insurmountable objections. I have reflected that, by taking advantage of the level, the coppers, or boilers, might be so placed as to replenish each other by cocks, but it must at once be obvious that, to empty each copper into its next lower, the cock must proceed from the bottom, and as they are all suspended, as it were, by their rims in the furnace, the action of the fire on the cock would be so great as to entirely change the nature of so much of the fluid as it contained, or else entirely to consume it; and this inconvenience would increase more and more as the liquor in each copper approaches nearer and nearer to the nature of sugar, at which stage a very little too much fire changes its character entirely. Again, if the evaporation was regular from all the coppers, per-

\* This mode of tempering cold prevents acidity, and is not new, though very good. It is on the plan of Dr. Higgins, about forty years ago. Dr. H. is the author of many useful improvements in the manufacture of sugar. Cleanliness, freedom from acidity, and rapid boiling, are the great points in sugar-boiling.

haps a contrivance, like the skipping machine I have seen sometimes used, might be adapted so as to descend into all at once, and being raised and moved on a frame above the tops of the coppers, supply each with the liquor taken from its fellow ; but I can think of no plan to obviate the boilermen's constant attention to cleaning and skimming the liquor. It requires, as I have observed in another place, the simultaneous application of the eye and hand, and, therefore, for the reasons already mentioned, I must leave this part and proceed with the sugar now skipped into the coolers, or large shallow wooden vessels, for the purpose of crystallization. While here it needs scarcely any attention after it is mixed, immediately on being thrown out of the last copper or tache.

These vessels, I have always considered, were very improperly placed too low, rendering the process of potting, or removing the sugar into casks, a very dirty and laborious operation ; generally performed by able men, with very little clothing on, smeared from head to waist with the drippings from the tub, or pail, which they fill at the cooler's side with the same liquid sugar, and carrying on their heads, throw into the casks. Here, again, a cheap and simple remedy may be universally applied, viz., let the boilers be placed as high and as near the tache as possible ;\* say, let the syrup be thrown direct from the tache into the first without the intervention of any gutter, or, at all events, the shortest possible, and observing that it is as high as the usual throw of the people skipping will allow, the guttering to the others must be made along

\* The coolers must not be too near the coppers on account of the temperature ; they are generally in a shed with open blinds to admit the air ; and the gutter leading to the cooler must not be laid too high, or it would interfere with the action of the boilermen.

one end. Each cooler should be distant from the others eighteen inches or two feet, to allow the man removing the sugar plenty of room. The object of having the coolers placed high is, that the casks, being brought on a truck or carriage along the end of the cooler, may not be much above its edge in height, so that the person potting, instead of shovelling the sugar into a tub or pail (to be carried on his head), may at once shovel it into the cask, which, being on a carriage working on a railway, can easily be conveyed and deposited in its place in the curing-house to drain: and ingenious persons might adopt this improvement on almost every estate at 4*l.* or 5*l.* expense, which would greatly facilitate this necessary work, and prevent great theft and waste. But I must not omit the labour required in the carriage of the fuel, and making the fire to boil the sugar; and here again, according to circumstances, I would apply either a railroad or an elevator, whichever would suit the situation best. The peculiar nature of the fuel used in Jamaica encourages me to hope that a machine will yet be so contrived that it will grasp the trash, and regularly and steadily feed the furnace, as this is one of the most laborious and essential purposes to which human hands are appropriated, but not of that nature that contrivance cannot relieve. The conveyance of the refuse of the mill-house, boiling, and curing-house to the still-house, for the manufacture of the rum, is very simple, and only requires the least attention to take every advantage of the level, that the materials may run together by means of cocks, and as little pumping as possible, but pumping must be resorted to for the conveyance of some of the materials in most situations. The most favourable constructions, where the convenient disposal of the other

buildings will admit of such, is to have the distil-house immediately below the curing-house; but simple, and obviously advantageous, as this arrangement is, the apathy that thwarts the most trifling improvement is perfectly astonishing. Seventeen years since I suggested to an attorney the necessity of having a pump and guttering erected from the curing-house to the still-house for the conveyance of the molasses, then taking the effective labour of two people to convey it on their heads, up and down sundry steps, and a distance of 100 feet; but, strange to say, not only does this extraordinary system continue to the present time, but the changes in our system have all passed over without effecting even this simple improvement, which would have saved at least 500*l.* to the proprietor, for the period I have mentioned; and so it is, and will continue, so long as situations are so precarious. There have been nine or ten different overseers (as the managers are called) on *that* estate; and of the sixty odd sugar estates in the same parish (of St. Mary's), I state a fact in asserting that there are not a dozen on which the managers have resided for three years together.\* But to conclude, I will sum up the saving of manual labour that is effected by the arrangements herein suggested, and, as a basis, I will suppose the bulk of the crop has to be carried on an average three-quarters of a mile, and the estate is calculated to manufacture two tons of sugar in twelve or fourteen hours, the saving will then be five out of every six people employed as wainmen, and boys; the two mill-feeders and the trash-carriers and turners will be dispensed with, the canes being put into the mill by the elevator, and

\* Neither of these two last remarks can be deemed of general application; certainly not in other parishes in the island.

the trash taken from it in the same way; the cane-carriers, instead of lifting *every cane* to their shoulders, and carrying it to the feeding-board, will be only required to put them on the elevator, and a great advantage will be gained by their being always in sight; the green and dry trash carried, generally averaging from six to eight or ten females, will be dispensed with, excepting two only to put the dry fuel on the carriers. The overlooker (generally an active, intelligent person) will with great ease regulate and adjust the whole apparatus, which, without a fear of failure, can be constructed to effect all the saving mentioned at an outlay of (at the utmost) 1000*l.* sterling, on nine out of every ten estates in this island. This saving may be made up, namely, —

Present Mode.	Proposed.	Difference.
6 Wainmen and boys	1	5
2 Feeders	0	2
1 Trash-turner	0	1
8 Trash-carriers	2	6
3 Cane-carriers	2	1
—	—	—
Total 20	5	15 people,

at the present rate of hire, while working extra time in crop, may be stated 2*s.* each, or 7*l.* 10*s.* per week of five days, which, if continued for a year, would save, independent of the work of twenty head of oxen for the same time, the sum of 390*l.*, or nearly forty per cent, on the capital required. These are my ideas, founded on experience, and I have purposely avoided allusion to expensive and intricate machinery, which in this country must, for a long time to come, defeat the intentions of those introducing it, from the impossibility of getting it



either properly *attended to* or *repaired* — I mean generally, as, of course, there are some properties peculiarly situated. As to the practicability of these suggestions, I have, on a small scale, proved the advantages to be derived therefrom, having, at the cost of about 10*l.*, laid down a railway in the roughest manner, and of very defective materials, but it served the purpose of curtailing my expenditure fully 30*l.* per annum for seven years, and enabled me to perform work with three people, with certainty and despatch, which previously had been imperfectly accomplished by ten. It is unnecessary to enlarge further, and it will strike every proprietor what an advantage the saving of manual labour above proposed would be if generally adopted in this country at the present moment, when labour is so *very* precarious, and the expensive and doubtful scheme of emigration (the only remedy proposed) must be very slow, let it operate ever so beneficially. I believe there is no country in the world where simple machinery for the abridgement of human labour has so great a scope for being advantageously employed : that it has been so totally neglected every reflecting mind must regret ; but I look forward, with lively hopes, to a universal system of improvement being produced by the application of steam conveyances to this island, enabling the Jamaica proprietors, with convenience, to visit their property ; and when they find persons residing on them worthy of their confidence, they will occasionally direct the improvement of their properties *in person*, attach their tenantry to their landlord's interest, encourage honest industry to hope for deserved reward, and individuals to depend upon Jamaica as a home from their outset in life ; and this is absolutely required, as much for the moral and intellectual improve-

ment of the community as the introduction of machinery is to increase its physical strength ; for what man of feeling, in the present uncertainty attending a planter's employment, can marry or surround himself with the endearments of home? \* and to *this cause solely* is to be attributed the irreligious and irregular lives led by nine-tenths of the inhabitants of tropical climates, entailing *misery on generations*, which, by no effort of their future life, can be alleviated or removed.

I am, Sir, &c. &c.

WILLIAM ARTHUR CLEMENTS,

A Sugar-Planter of twenty years' experience.

*To the President, &c.*

*of the Society of Arts, &c.*

\* Overseers who are married are now encouraged very generally.